PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in Apparatus for Transferring Articles from a Machine to a Conveyor or Another Machine

We, BALL BROTHERS COMPANY, a corporation of the State of Indiana, United States of America, of Macedonia and Ninth Streets, Muncie, Indiana, United States of America, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a machine for transferring glass articles from a glass-forming machine, to a lehr, and has for its object to provide such a machine which is capable of being employed with a continuously rotating forming machine, which is simple but rugged in construction, and occupies a minimum of floor space.

With the above object in view the present invention consists in a machine for transferring glass articles from a glass-forming machine to a lehr comprising a plurality of article-carrying members having article-receiving receptacles pivotally mounted thereon, a common support for all of the members and to which each member is hingedly connected for swinging movement, means for continuously rotating the support, means for swinging each rotating member between radial and vertical positions during each revolution of the support and means for tilting each receptacle to and from an article-receiving position during each revolution of the support.

In the accompanying drawings, Figure 1 is a diagrammatic plan view of apparatus embodying our invention shown in association with a finishing mold and a knock-out arm;

Figure 2 is a fragmental view diagrammatically illustrating one relationship between finishing mold, knock-out arm and ware-receiving trough, in which a portion of the finishing mold is shown in section for convenience of illustration;

Figure 3 is a vertical sectional view of the set-over mechanism diagrammatically shown in Figure 1, the section being taken along the line III—III of Figure 1;

Figure 4 is a side elevation of a composite trough-carrying member such as forms a part of the apparatus illustrated in Figures 1 and 3 with a portion thereof shown in section for convenience of illustration; and

Figure 5 is a plan view of the member shown in Figure 4 and associated with a dotted line diagram illustrating one phase of the movement of the member.

Set-over mechanisms employed in connection with glass-forming machinery are necessarily so arranged that they effectively handle hot glass articles without marring them. The problem occasioned by this type of service is to some extent increased where the glass-forming machine includes a continuously rotating mold carrying table from which the ware is discharged or delivered during rotation of the table. From the foregoing, it will be apparent that an object of our invention is to produce an effective set-over mechanism which is capable of cooperating with a continuously rotating forming machine and which itself receives and delivers ware while the ware-receiving receptacles thereof are in motion.

The apparatus illustrated as an embodiment of our invention includes a number of ware-receiving receptacles shown in the form of open-ended troughs each so mounted and arranged that each receptacle occupies an article-retaining position and is, in effect, moving with a discharging finishing mold at the time of receiving a glass article therefrom. This movement of the receptacle continues after the article is received thereby but the continued motion is such as to clear all moving and other parts of the forming machine. The receptacle is then actuated to deposit the article carried by it and, in the mechanism illustrated, this is accomplished by moving the trough-like receptacle from a horizontal to a substantially vertical position with the open end of the trough lowermost. This readjusting of the position of the trough takes place as the trough is moving and, consequently, the apparatus involves means for receiving the delivered article while that article is moving. We also contemplate employing cooperating conveyors for continuing the movement of

the article after it is no longer under the control of the moving receptacle or trough.

Each article receiving receptacle is carried at the end of an arm-like member and these members are carried by a rotatable table, which is rotated at such a speed as to move the article receiving receptacle at the same speed as the finishing mold of the associated forming machine during the operation of setting over were received therefrom. One such receptacle and supporting member is provided for each finishing mold of the forming machine and the arm-like members are adapted to be moved to radial positions during the operation of receiving and depositing ware and to swing downwardly to an inoperative position during other parts of its cycle.

Referring more particularly to Figures 1 and 3, a central, table-supporting column 6 is rigidly secured to a base 7 which is in turn carried by a sub-base 8. The sub-base 8 is mounted on a foundation structure 9 by means of four adjustable posts 10, each of which is shown in the form of a screw and is threaded into the sub-base and mounted on a thrust bearing 11 carried by a foundation member 9. Each such screw post is provided with a sprocket 12 which is engaged by a chain 13 looped around and engaging all of the sprockets for the purpose of simultaneously turning all posts 10 to raise or lower the sub-base and thus adjust its position with relation to the cooperating forming machine. One screw post 10 is provided with an extension 10^1 which is preferably squared or otherwise adapted to receive a hand-wheel 14 for turning it and consequently all of the other supporting posts through the agency of the sprockets 12 and chain 13. With this arrangement the sub-base 8 may be accurately positioned at the desired height above the foundation members and consequently the height of the set-over mechanism may be accurately adjusted with relation to the associated forming machine.

The base 7 is supported on the sub-base through the agency of parallel rails 15, shown as angle irons, and flanged wheels 16. The rails 15 are secured to the sub-base 8 and the flanged wheels are secured to the base 7 in such relationship that they engage the rails 15, provide for movement of the base 7 therealong, and also define the lateral position of the base 7 by reason of the engagement of the flanges with the rails. It will of course be understood that at least four flange wheels are provided for supporting the base and that each is journaled in a bearing carried by the base 7.

The base is moved longitudinally of the rails 15 by means of a gear 17 and rack 18. The rack is secured to the lower face of the base 7, preferably at a point midway between the rails 15 and extends parallel to these rails. The sub-base 8 is apertured to allow passage of the rack when the base 7 is moved relative to the sub-base 8 by the gear 17. The rack and gear are shown in dot-dash lines for the purpose of indicating that their positions with relation to the plane of the sectional view are to some extent optional. As thus diagrammatically illustrated, the gear is carried by a shaft 17^1 supported in suitable bearings (not shown) which may be carried by the foundation members. The shaft is adapted to be turned by a handle 20 for the purpose of shifting the position of the base 7 along the rails 15. A pawl and ratchet connection may be provided between the handle 20 and the shaft 17^1 so as to facilitate the operation of the rack and gear connection.

A sleeve 21 is telescoped over the central column 6 and is carried by that column through the agency of a ball bearing 22. As shown, the lower race of the bearing 22 is carried by an upwardly faced shoulder of the non-rotatable column 6 and the upper race of the bearing supports a table 23 which is rigidly secured to the sleeve 21 and is so formed that it in effect provides a re-entrant flange for the sleeve 21 which engages and is supported by the upper race of the bearing 22. The column 6 is provided with an extension 6^1, shown formed in two diameters, and which provides a support for a non-rotatable table 24 located immediately above and concentric with the rotatable table 23. The table 24 overlaps the table 23 and, as will be described, provides a support for cams which cooperate with and actuate mechanisms carried by the table 23.

The sleeve 21 is driven by a drive shaft 25 through the agency of bevel gears 26, 27, a stub shaft 28 journaled in a bearing carried by the base 7, a gear 29 and a gear 30. The last mentioned gear is shown secured to the lower end of the sleeve 21 and surrounding the central column 6. It will be apparent that the stub shaft 28 and its bearing projects downwardly through a suitable aperture provided in the sub-base 8 to allow for relative movement between the two bases 7 and 8. It will also be apparent that the bevel gear 26 is splined or otherwise secured to the shaft 25 so that it may be adjusted to accommodate this relative movement.

The apparatus diagrammatically illustrated in Figure 1 is designed to serve an eight-mold forming machine and is, therefore, provided with eight ware-receiving receptacles, each of which is generally designated by the numeral 31. Each receptacle 31 is carried by a composite member or arm 32 and for convenience of illustration one such member is omitted from Figure 1 but the position of its supporting bracket 33 is shown in dotted lines and four are shown in vertical or inoperative position. Each bracket 33 is secured to the rotating table 23 and overhangs the edge of that table. As shown more clearly in Figs. 4 and 5, each member 32 includes a hinge plate 34 and a carrier arm 35 on which the ware-receiving receptacle is mounted. The receptacle 31 is shown in the form of a trough closed at its inner and open at its outer end. As will be described, the trough is tiltable to different positions and this movement is controlled by a trough-actuating plunger 36 and a trough-holding spring 37 which resists the movement of the plunger.

The plate 34 is carried by a hinge pin 40 which in turn is carried by the bracket 33 and the arrangement is such that the plate 34 may swing about its supporting pin and occupy a substantially vertical position, as shown at the right-hand side of Figure 3, or a substantially horizontal position, as shown at the left-hand side of Figure 3. This swinging movement of the plate, and consequently of the parts carried by it, is controlled by a stationary cam track 42 which is carried by the base 7 and encircles the central column 6. As shown, the plate 34 is provided with a cam roller 43 which engages the cam track 42.

The arm 35 is pivotally secured to the plate 34 by means of a pivot pin 44 which is carried by the plate 34. The arm is normally held against an adjustable stop 45 by means of the spring 38. As shown, the stop 45 is in the form of a bolt carried by an appropriately threaded lug 46 formed on the plate 34. The position of the bolt with relation to the lug 46 is readily adjustable and may be fixed more or less permanently by the lock nut 47. Arm 35 is normally held against the stop 45 by means of the coil spring 38 which operates between a lug 48 carried by the plate 34 and a lug 49 carried by the arm 35. Thus, the arm 35 is capable of pivoting about the pivot pin 44, and is normally yieldingly held against the stop 45 by means of the spring 38.

The wear-receiving trough 31 is pivotally secured to a bracket 51 which is rigidly secured to the end of the arm 35. As shown in Figure 4, the trough 31 tilts about a pivot pin 52 carried by the bracket 51, and is normally held in ware-receiving position by the spring 37 which operates between a lug 37^1 carried by the plate 34 and a lug 31^1 carried by the trough 31. This spring normally holds a finger 53 carried by the trough in engagement with an adjustable stop 54 carried by the arm 35 and bracket 51. Stop 54 is shown in the form of a screw which projects upwardly beyond the bracket 51 and is provided with a lock nut for the purpose of holding it in adjusted positions.

The plunger 36 is slidably mounted in a plunger block 55 which is suitably secured to the arm 35. This plunger is provided with a cam roller 36^1 which is adapted to engage a stationary cam 56 for the purpose of shifting the position of the trough 31 in opposition to the pull of the spring 37. The cam 56 is carried by the stationary table 24 and the cam actuated movements of the plunger 36 are imparted to the trough by means of the link 57, one end of which is pivotally secured to the trough by means of pivot pin 57^1 and the other end of which is pivotally secured to the plunger 36 by means of a pin 57^{11}. This last-mentioned pin is carried by a bifurcated member 58 which is adjustably secured to the plunger 36 by means of a screw shank with which it is provided. The shank is threaded into the end of the plunger 36 and is held in place by a lock nut 59.

The plate-like arm 35 is provided with a finger 61 for periodically swinging it about the pivot pin 44. As shown, the arm is provided with a cam roller 61^1 and is adapted to periodically engage a stationary cam 62 as the table 23 turns and as the arm 35 revolves about the column. The cam 62 is carried by the stationary table 24 and is so formed and positioned that its effect is to momentarily accelerate the angular velocity of the associated receptacle 31 for the purpose of clearing an operating part of the forming machine, i.e., a part associated with the finishing mold which has just discharged an article.

In Figures 1 and 2 we have more or less diagrammatically shown a finishing mold of the associated forming machine and the positions it momentarily occupies with relation to an article receptacle 31, just prior to delivering an article to the receptacle and also just after such a delivery has been accomplished. These molds are usually three-part molds in that they include two sections hinged together which cooperate with a base sec-

tion to form the mold cavity when the sections of the mold occupy the position ordinarily termed the closed position. In Figures 1 and 2 the finishing mold is illustrated as including two hinged sections 65 and a base section 65*a*. It is also illustrated as associated with a knock-out arm 66. This arm is pivoted to swing about a pin 66[1] carried by the forming machine and is provided with a head 66[11] adapted to engage a finished article 67 and hold the article in place on the base 65*a* of the mold as the hinged sections 65 are opening.

Thus it will be apparent that the knock-out device associated with a finishing mold engages the exposed upper edge or lip of the finished article as the blow mold, enclosing that article, moves toward the article delivering station. This engagement is accomplished just prior to the initiation of the opening movement of the hinged sections 65 of the mold, with the result that the finished article is in effect clamped between the head 66[11] and the mold base 65*a* during the entire period that the mold is opening sufficiently to release and discharge the article. During this movement of the mold an associated receptacle 31 is also moving toward the article discharge position of the forming machine and under such conditions that the discharging mold and the receiving receptacle will, in effect, move together throughout a short sector of their travel and at the instant of transferring the article from the mold to the receptacle. It is, of course, apparent that the movement of both the mold and the receptacle must continue after the transfer is accomplished and it will also be apparent that the finishing mold must be repositioned in order to receive the next successive parison. In a forming machine such as previously mentioned, a continuation of the normal movement of the receptacle 31 will cause it to collide with an operating part of the forming machine. For that reason the cam 62 acting through the cam roller 61[1] and the finger 61 momentarily turns the plate-like arm 35 about the pin 44 in opposition to the pull of the spring 38. The cam is so shaped that as the roller 61[1] moves along it, by reason of the rotation of the table 23, it permits the spring 38 to retract the plate-like arm 35 so that it again engages the stop 45 with the result that the movement of the associated receptacle 31 is momentarily controlled, i.e., by the cam 62 in order to insure proper functioning of the mechanism.

The cam track 42, for controlling the swing of the composite arm 32 about the pivot pin 40, is supported by the base 7 on one or more studs 42[1]. As shown, the cam track 42 surrounds the column 6 and the rotating sleeve 21 and the strut 42[1] is mounted on a casing 7*a* carried by the base 7 and enclosing the actuating gears of the sleeve 21.

Referring to Figure 1, a stationary arch-shaped slide 68 is associated with the set-over mechanism and in such relation as to receive the articles 67 as the receptacles 31 are tilted in response to the action of the cam actuated plungers 36. As shown, the slide is provided with a guiding flange 68[1] which cooperates with each tilting and tilted receptacle 31 in guiding an article along the slide and onto a conveyor belt 69. The belt 69 is carried by standards at least one of which—the standard 71—is supported on the base 7. Conveyor 69 is of ordinary construction and, as shown, is driven by a shaft 72 through the agency of sprockets 72[1] and a chain 73. The shaft 72 is journaled in hangers formed on the base 7 and is driven by the main drive shaft 25 through the agency of the bevel gear 26 and the bevel gear 74. Article guides 68[11] and 65*a* are associated with the conveyor belt 69 in such way as to direct the travel of articles along the belt and onto a rotating conveyor table 75 from which they may be delivered to a second conveyor belt 76.

Reference to Figure 1 discloses that after each composite arm 32 moves to such a position that the cam roller 61[1] thereof no longer engages the cam 62 and consequenty after the plate-like arm 35 has re-adjusted itself against the stop 45, the associated cam roller 36[1] moves into contact with the stationary cam 56. This takes place at about the time the associated receptacle 31 moves over the stationary slide 68 and, as a result, the plunger 36 is moved outwardly to tilt the receptacle through the agency of the connecting rod 57. Inspection of the drawings discloses that the cam 56 is so contoured that the tilting of each receptacle 31 is accomplished quite gradually and is completed only after the receptacle moves to a position above the conveyor belt. That is to say, each receptacle is gradually tilted to the article discharging position and this movement is completed only after the receptacle has moved the associated article 67 along the slide 68 and onto the conveyor belt 69. Cam 56 is so contoured that it permits the spring 37 more or less gradually to return the receptacle to the article receiving position with relation to its carrying arm 35 and bracket 51 as the receptacle swings away from the conveyor 69.

After each composite arm 32 has pro-

pelled an article such as a bottle onto the conveyor belt 69, it continues its rotation in an extended position until it and all parts carried by it clear the conveyor. As this position is reached the cam roller 43 rides down an inclined portion 42*a* of the cam track 42 and thus permits the composite arm to swing downwardly around its hinge pin 40. The cam track is so formed that the composite arm 32 moves downwardly to an almost vertical position and remains in that position as it swings through approximately 180° of its travel around the column 6. During this travel the roller 43 may bear on the portion 42*b* of the cam track. As each arm 32 approaches the article receiving position its cam roller 43 rides up an inclined portion 42*c* of the cam track, thus lifting the hinged portion of the arm to a substantially horizontal position. Thus it is apparent that each article receiving receptacle 31 is alternately retracted and extended with relation to the centre about which it revolves and that it arrives at the extended position immediately before receiving an article and continues in that position as it moves to convey that article toward and onto the moving conveyor 69. During this last mentioned movement its revolving movement around the column 6 is modified by the action of the cam 62 and in the particular embodiment this modification consists of a momentary acceleration followed by a corresponding deceleration.

From the foregoing it will be apparent that we have produced a new and improved set-over mechanism which is capable of functioning effectively in receiving articles from a continuously rotating glass-forming machine and in setting over articles so received. In addition, the set-over mechanism is so constructed and operated that the moving parts thereof are caused to perform their individual functions while continuously revolving about a central column or a fixed axis. In this connection each article-receiving receptacle is so actuated by a rotating device, such as the table 23, that it continuously moves around an axis of revolution although this linear velocity is modified both by moving it toward and from the axis of revolution and by periodically accelerating and decelerating its angular velocity. The first-mentioned control is accomplished by the cam track 42 through the agency of the cam roller 43 and the last-mentioned control is accomplished by cam 62 and cooperating parts. It will also be noted that the associated devices and instrumentalities are so arranged that each trough-like receptacle 31 is cam tilted to a position at an angle with its carrying arm for the purpose of delivering an article contained therein, that the delivery is not completed until each article moves onto a mechanically actuated conveyor and that the receptacle carrying arm then swings about its hinge pin to retract the receptacle or to move it closer to its axis of revolution.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A machine for transferring glass articles from a glass-forming machine to a lehr comprising a plurality of article-carrying members having article-receiving receptacles pivotally mounted thereon, a common support for all of the members and to which each member is hingedly connected for swinging movement, means for continuously rotating the support, means for swinging each rotating member between radial and vertical positions during each revolution of the support and means for tilting each receptacle to and from an article-receiving position during each revolution of the support.

2. A machine as claimed in claim 1 having article-carrying members each comprising a hinge plate and an arm pivotally secured thereto, and an article-receiving receptacle pivotally secured to each arm, and means for moving each arm relative to its supporting hinge plate during each revolution of the support.

3. A machine as claimed in claim 2 having means for moving each article-receiving receptacle toward and from the centre of rotation of the support once during each revolution of the support.

4. A machine as claimed in claim 3 having cam means for swinging each article-carrying member to and from a radial position once during each revolution of the support.

5. A machine as claimed in claim 3 having cam actuated means for tilting each article-receiving receptacle while in an extended radial position.

6. A machine as claimed in any of the preceding claims having means for rotating the support at a uniform angular velocity, and means for varying the angular velocity of each of the members when receiving an article during each revolution of the support.

7. A machine as claimed in claims 2 and 6 having means for moving each arm relatively to its hinge plate to cause the variation in angular velocity of the article-receiving receptacles.

8. A machine as claimed in the preced-

ing claims having a foundation member, a sub-base adjustably secured to the member, rails carried by the sub-base, a wheel supported base carried by the rails, a rack and pinion for adjusting the position of the base along the rails, and the receptacle support rotatably mounted on the base.

9. A machine for transferring glass articles from a glass-forming machine to a lehr substantially as described with reference to the accompanying drawings.

Dated this 2nd day of May, 1938.

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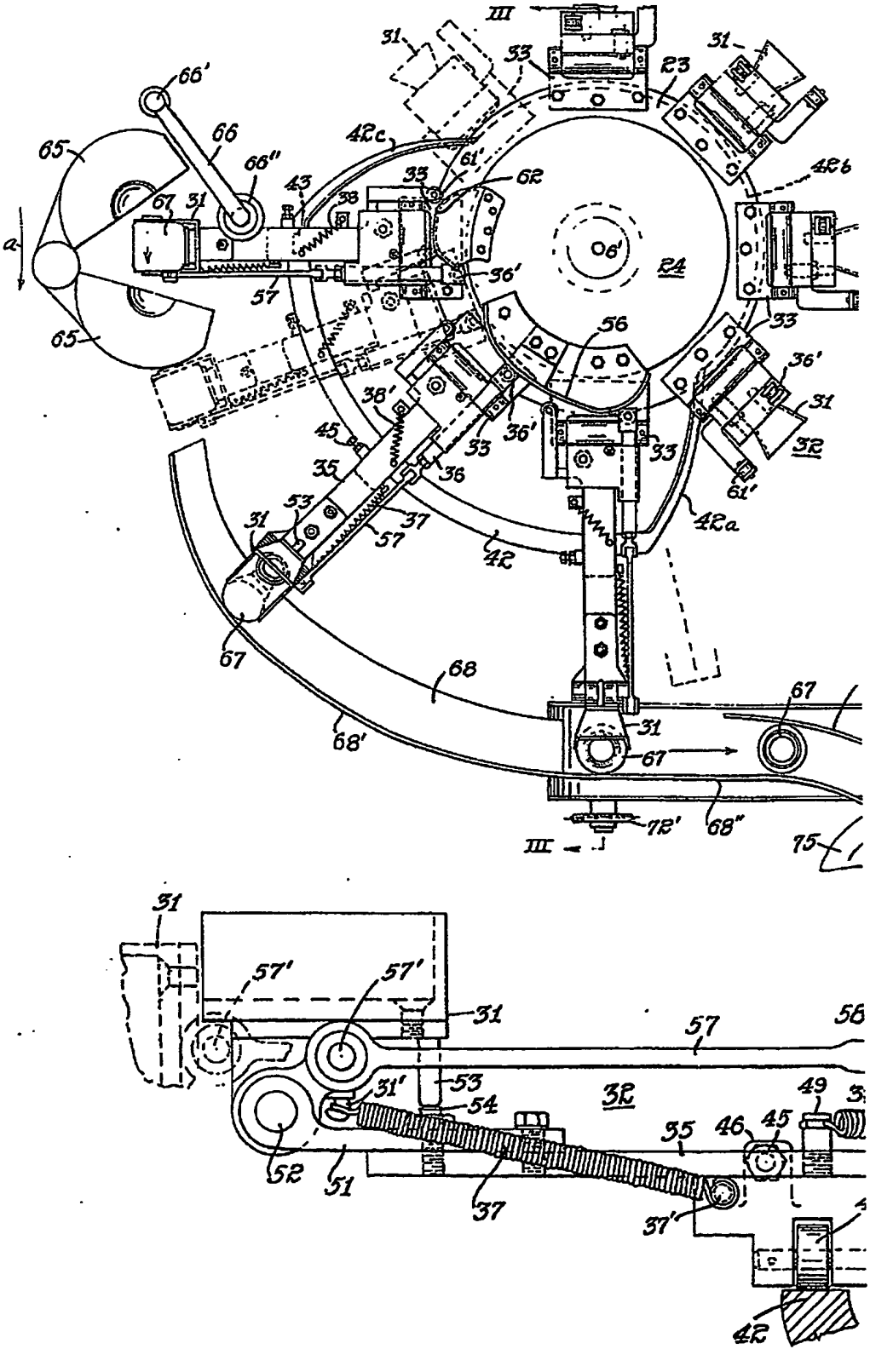


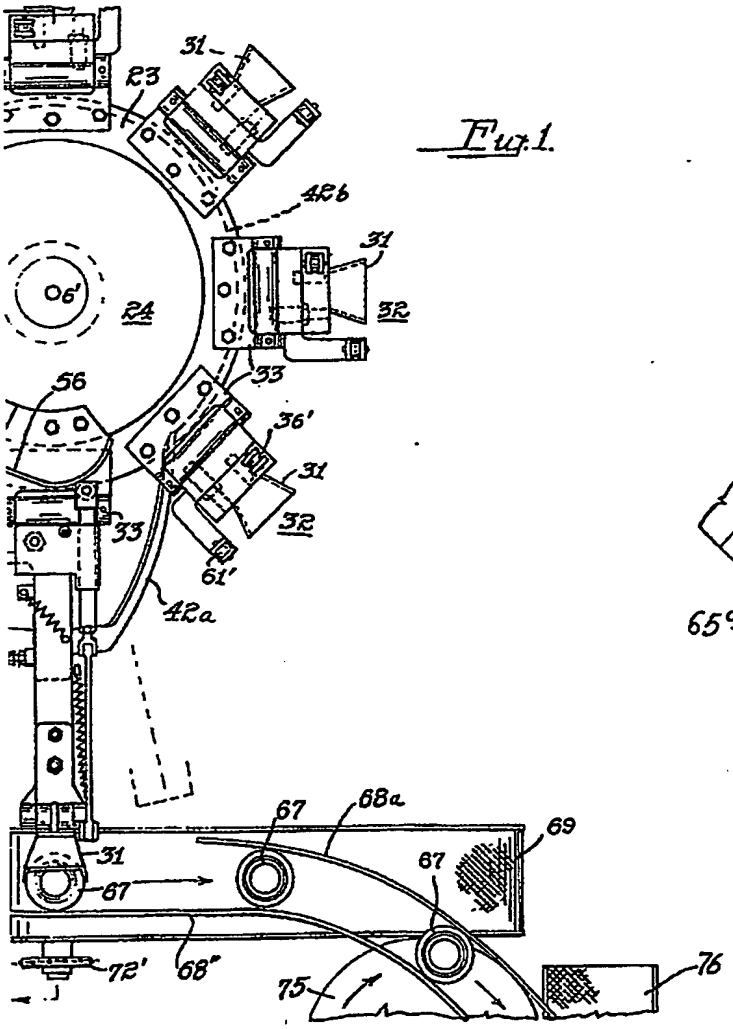


Fig. 1.

Fig. 2.

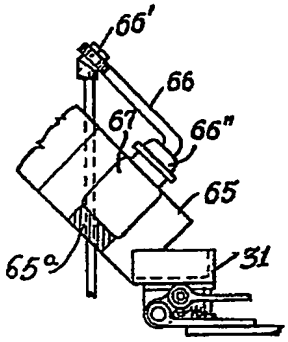
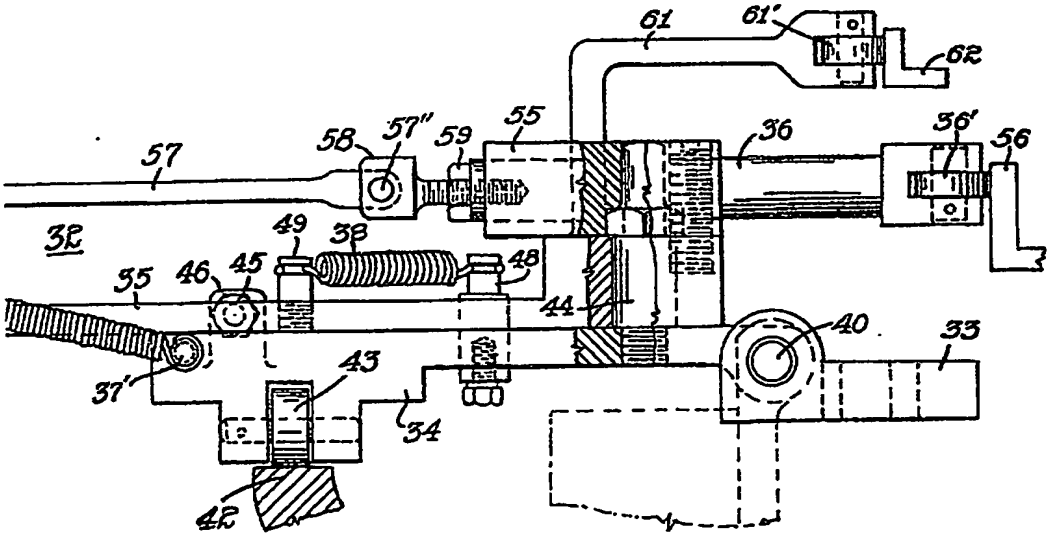


Fig. 4.



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SHEET 1

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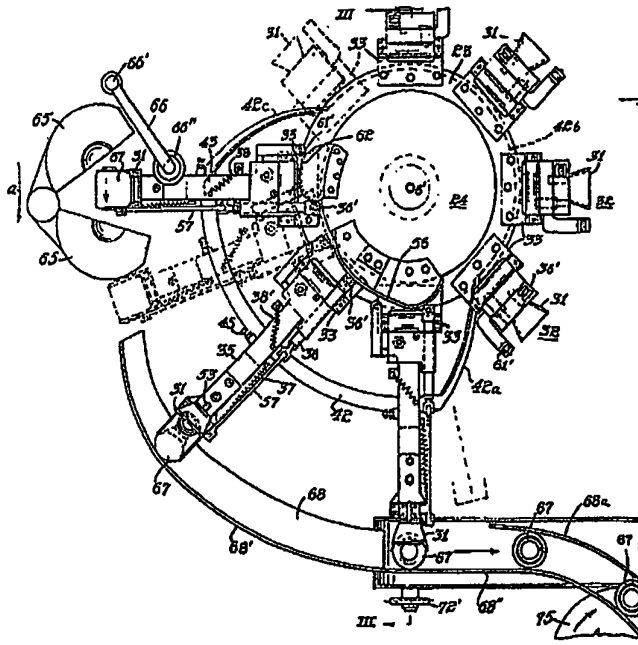

Fig. 1.

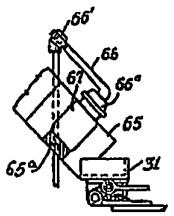

Fig. 2.

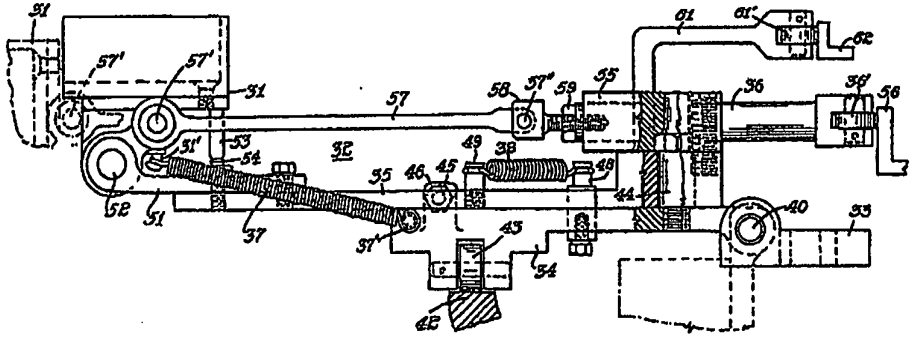

Fig. 4.

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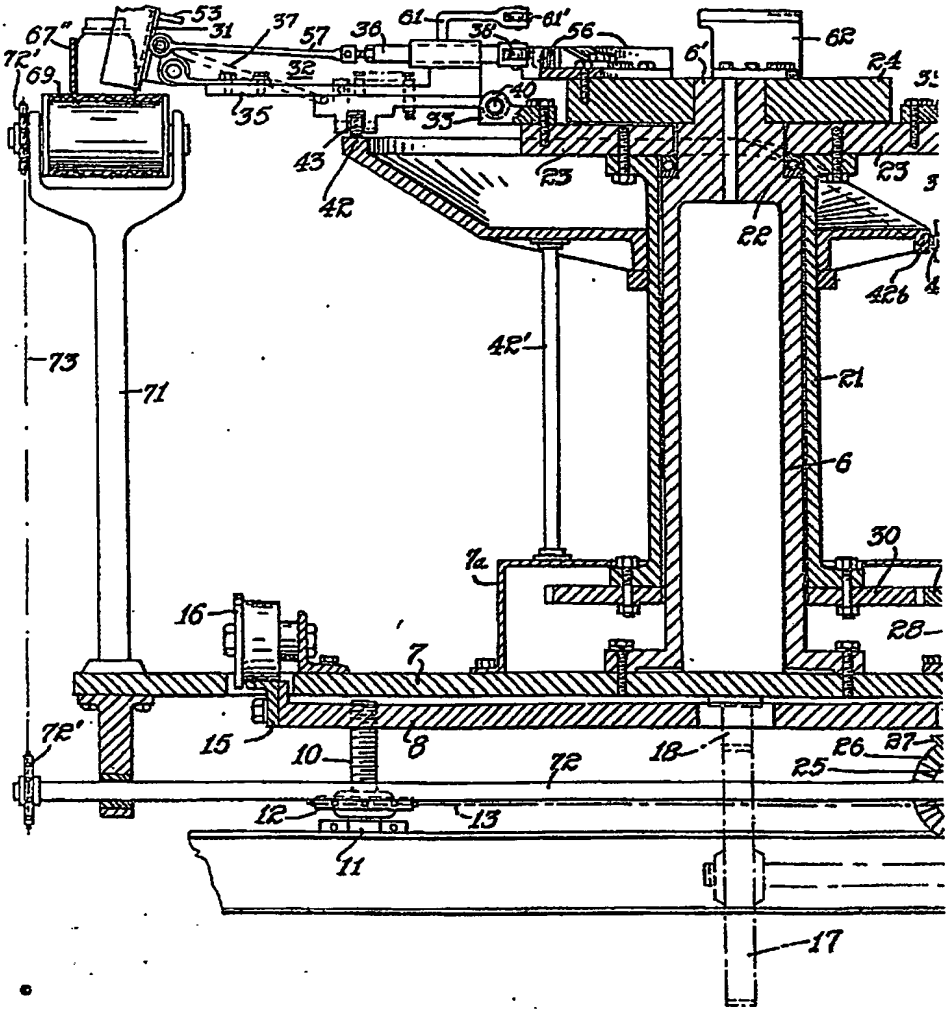
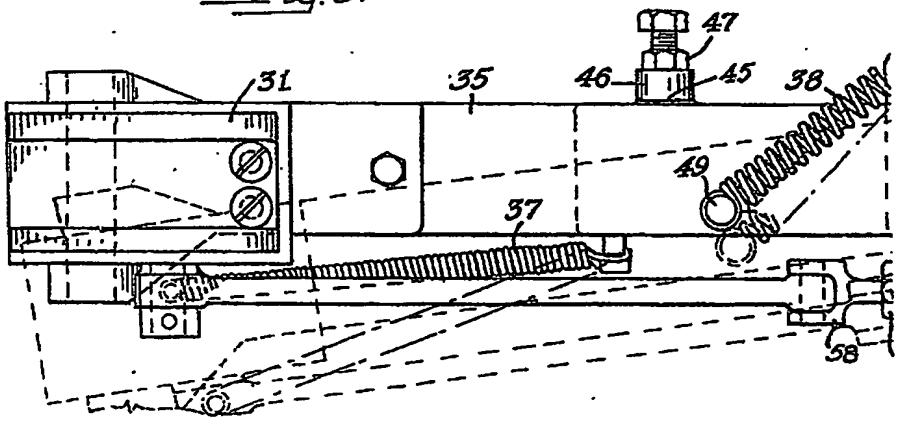


Fig. 5.



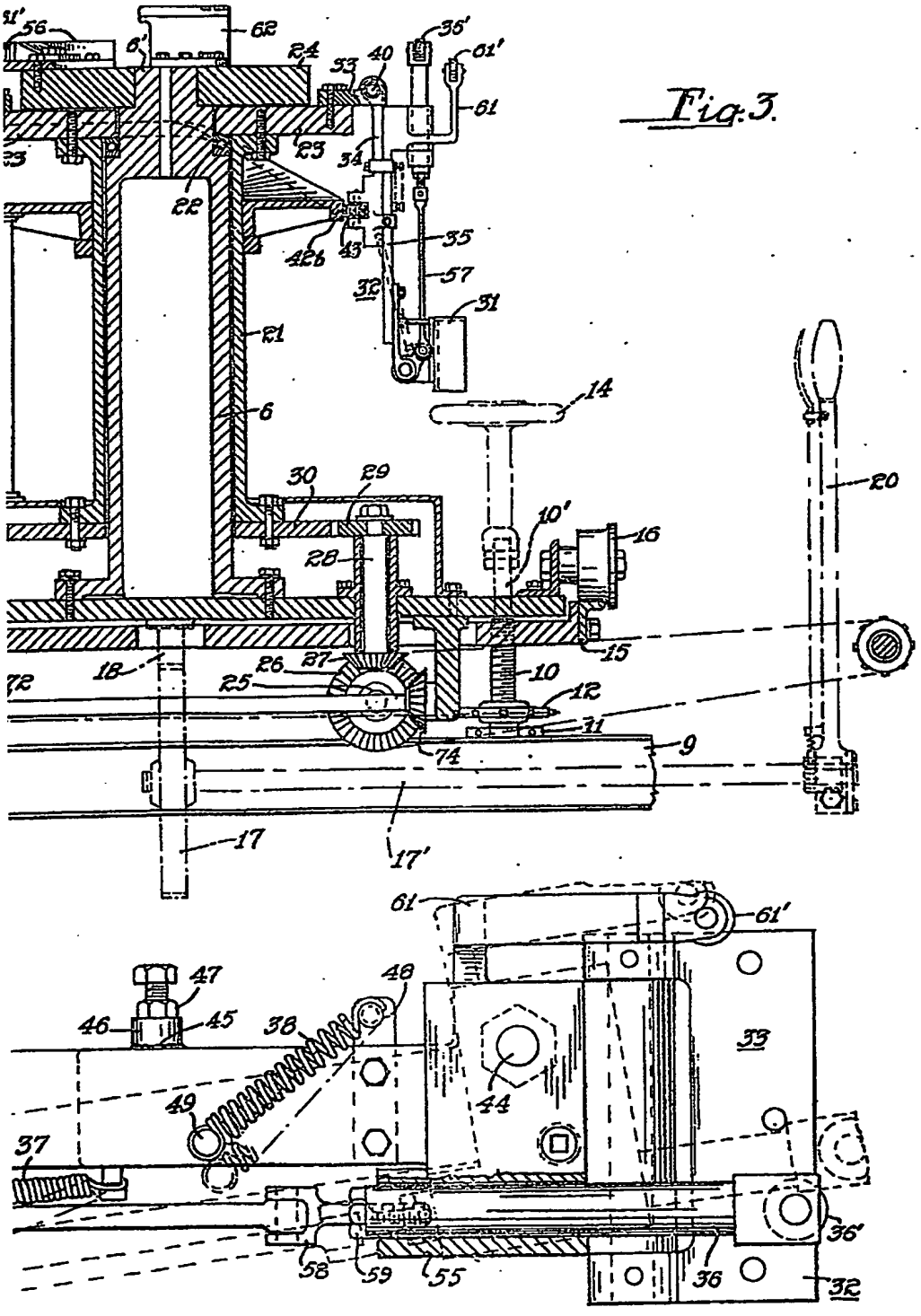


Fig. 3.

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Fig. 3.

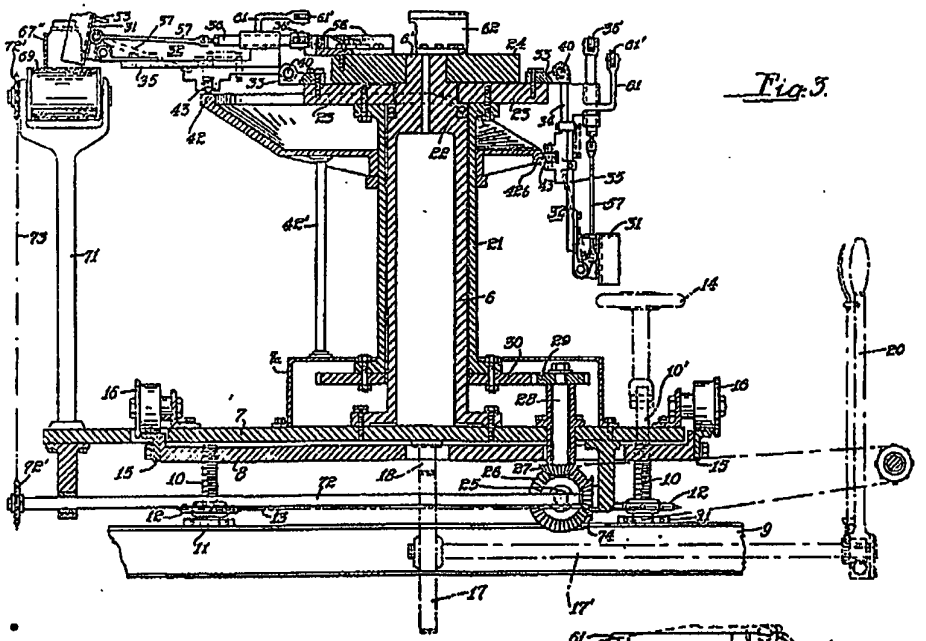
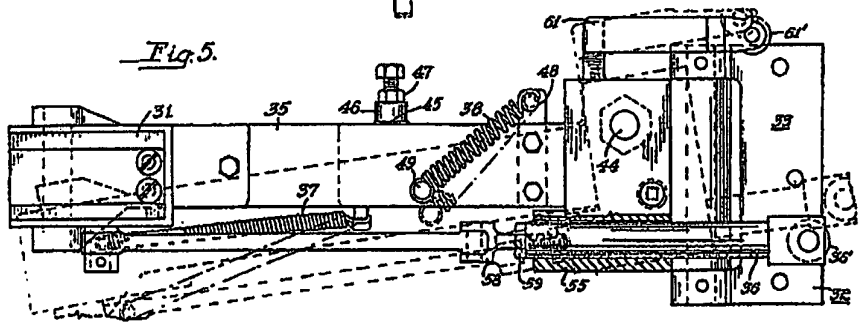


Fig. 5.



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